Title: **Sustainable Construction and Socio-technical Transitions in London's Mega-Projects**

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Abstract

Sustainable construction attempts to mitigate the destructive impacts of building on the global environment. Mega-projects in London, such as Blackfriars Station and the Shard, symbolise urban renewal and are promoted as engines for sustainable development, principally through their use of sustainably procured materials. Unique buildings which are monumental and often state-backed act as niches or incubators for sustainable construction, because they operate as protected spaces where the general rules of construction do not apply. Decision making in sustainable construction is complicated by the multiple state and public stakeholders involved in projects such as large stations and skyscrapers and the different perspectives of architects, developers, procurement specialists, end users and others. While there are diverse actors involved, there has been some international convergence in the construction sector around how to deliver sustainability, and sustainable procurement has become the primary social and technological change through which more sustainable approaches to construction are delivered. Using interviews and questionnaires undertaken with six leading contractors involved in some of London's mega property and transport infrastructure projects, we analyse how sustainability procurement is deployed in the construction industry. Socio-technical transition theory provides a way to understand the context-specific developments led through mega-projects, which are at the forefront of promoting the use of sustainably procured materials and technologies. Our research demonstrates that moves to deploy a more sustainable approach are based around modifications to current practices rather than fundamental transformation. Cost and risks are frequently cited as barriers to the sustainable procurement of materials, while some contractors are sceptical of the improvements that can be delivered through sustainable procurement.

Introduction

Construction is one of the world's largest economic sectors and interest is growing in the environmental impacts of building. Research is centred on integrating sustainability in to the design, construction and use of the built environment (Hill and Bowen 1997; Leaman and Bordass 2007). Construction is both key for economic growth and prosperity, while being environmentally destructive and using vast amounts of natural resources. The construction and operational use of energy in buildings is responsible for almost 47% of total UK CO_2 emissions, 80% of which comes from in-use building emissions (HM Government 2010, 3-4). Additionally, the sector is the cause of a considerable amount of air and water pollution incidents. Conversely, it is a key source of employment and is commonly an indicator of economic success and accounts for 8% of UK gross domestic product, suggesting that while spending on construction is positively valued by society, it is also a principal measure of environmental damage (HM Treasury No Date; Orueta and Fainstein 2008; Shi *et al*. 2012).

Mega-projects in London, such as the Swiss Re Tower (aka The Gherkin) and the Olympic Park have been celebrated as symbols of a vibrant economy and engines for sustainable urban development, through their use of sustainably procured goods and materials (Hayes and Horne 2011; Wood 2007). Socio-technical transition theory provides a way to understand the spatially uneven and context-specific transition to sustainable construction led through such mega-projects (Smith *et al.* 2005). Socio-technical transitions occur when an established system – like the construction industry – is disturbed and a new way of organising economic activity emerges. As well as technological change, such as the use of 'green' building materials, or low emission energy sources, system innovation involves the co-evolution of new power relationships and cultural, social and political institutions which guide or inhibit transitions to sustainability

(Lawhon and Murphy 2011). Our research illuminates how sustainable procurement has become the means through which a nominally sustainable approach to construction is being deployed. This paper proceeds by reviewing literature on the drivers and barriers to sustainability in the construction sector, with a specific focus on mega-projects in London. Next, the theoretical framework of socio-technical transitions is introduced to conceptualise how sustainability is becoming established (Berkhout *et al.* 2004; 2006). After a brief discussion of methodology, the empirical fieldwork is then presented. Research with key players in London's mega-project construction sector demonstrates how sustainability managers and procurement specialists operate within the broader dynamic of socio-technical evolution (Shove and Walker 2007). The concluding section explores the winners and losers in regime transition, and lessons for policy makers, as well as discussing how moves to establish a sustainable approach are based around modifications to current procurement practices rather than a fundamental reworking of the construction sector.

The key arguments of this paper are four-fold. First, mega-projects are positioned by their advocates in the state and business as a means to lead a transition to more sustainable approach to constructing the built environment (Fainstein 2008). Secondly, mega-projects in London are a niche or incubator for sustainable construction, because they operate as protected spaces where the general rules that dictate approaches to construction do not apply; for instance they are monuments, which are unique, and often state-backed (Affolderbach and Schulz 2015). Thirdly, the way in which sustainable construction is framed is predominately through the narrow focus on the sustainable procurement of materials, and voluntary certification in procurement is the most tangible, visible and widely adopted approach to measuring sustainability (Glass *et al.* 2012; Upstill-Goddard *et al.* 2012). Fourthly, and most significantly, our empirical research

illuminates how procurement specialists have privileged knowledge of the processes through which sustainability is deployed and that partial and sometimes flawed approaches to sustainability are delivered to meet the needs of clients as well as other stakeholders.

Sustainability and Mega-projects

Recent years have seen the expansion in sustainable construction practices worldwide to address climate change and other pressing environmental issues: through alternative urban design, reduced greenhouse gas emissions and sustainable resource use (Brown and Southworth 2008; Shi *et al.* 2012; Walker and Phillips 2009). Despite increasing interest the building industry has generally struggled to implement sustainability principles (Upstill-Goddard *et al.* 2013). Predominately it is bespoke or high profile developments, such as mega-projects or eco-homes that benefit from sustainable approaches (Gibbs and O'Neil 2014). Rather than being an obligatory and fundamental principle of construction, sustainability is seen as an add-on and a form of corporate social responsibility (CSR) (Brown and Southworth 2008). Insufficient client demand (Young and Osmani 2013), the lack of cohesive top-down strategies (Häkkinen and Belloni 2011; Hill and Bowen 1997), and the fragmented and multi-stakeholder nature of the building industry are all further barriers (Shi *et al.* 2012).

Neoliberal states have created legal, political and economic frameworks that encourage big urban projects while also promoting market-led development and decentralised decision making (Hayes and Horne 2011). High profile developments play an important role in forming attitudes and approaches towards sustainable construction (Fainstein 2008). This is especially true of large conspicuous building projects in London like the Shard or the forthcoming Garden Bridge that transform biophysical and social landscapes 'rapidly, intentionally, and profoundly in very

visible ways, and require coordinated applications of capital and state power' (Gellert and Lynch 2003, 15-16). It is a major challenge to analyse the material changes and displacements wrought through mega-project development (Gellert and Lynch 2003). Mega-project construction involves both the direct use of material – concrete, glass, steel, timber, etc. – and forms a new environment which structures the consumption of individuals and institutions. For instance the building of new mass transport networks and integrated retail centres, like the re-development of Saint Pancras Station, leads to new patterns of consumption. A bias towards mega-projects is reinforced by international leading institutions, major construction firms and the 'monumentalist' tendencies of government to build edifices to the state located in the national capital, such as the Olympic Park and Millennium Dome (Shi *et al.* 2012).

'Sustainable' high-profile mega-projects are driven by the state and large clients who value sustainability and usually work with major contracting firms who are experienced with marketing their sustainable approaches, especially in terms of procurement (Glass *et al.* 2012). A rhetoric of legacy and environmental sustainability are important in legitimising today's mega-projects, yet can conceal their real aims and consequences (Orueta and Fainstein 2009). Tall, multi-story mega-projects in particular divide opinion. From one perspective the concentration of population or commercial space in high density structures reduces transport costs and urban expansion; tall buildings provide economies of scale, enhancing their sustainability; whereas a counter argument follows that the embodied energies required to construct at height makes them inherently anti-environmental (Wood 2007). Mega-projects – whether skyscrapers or subterranean networks – are technically complex with systemic uncertainties which makes them problematic for the management of risk and budgeting. There is a systematic bias towards cost inflation as well as an optimism bias, as hopeful claims are made towards the positive

environmental and social impacts of major urban developments and such claims are often made on the basis of difficult to audit new technologies (Upstill-Goddard *et al.* 2012). London mega-projects can act as 'showcases' for green design and new technologies. Norman Foster's Swiss Re tower incorporates innovative ventilation technology and is singled out by Wood (2007) as being amongst the best 'environmental' tall buildings ever built, while Faulconbridge (2013; 341) argues the so-called 'Gherkin' 'has become infamous for its use (and the misuse) of natural ventilation through opening windows'. Despite these challenges the insights provided by high-profile buildings are mobilised to inform knowledge of working within regulations and building requirements and the complexities of client demands that can inform the broader construction sector landscape, demonstrating that this niche may offer prescient signal cases that require research (Fauclonbridge 2013).

The planning of sustainable mega-projects is constrained by the legal and social landscapes in which they occur. Normative building codes determine the sustainability of buildings, as do other regulatory instruments including mandatory labelling, market based certification schemes, fiscal instruments and incentives such as tax rules. This can include standards set by the clients in civil engineering projects such as Network Rail who have tried, tested and trusted approaches they want implemented on builds they commission. The UK government's policies encourage a move towards sustainable construction methods, although green goals and targets do not always translate to finished projects (Leaman and Bordass 2007). Integrating sustainability is not mandatory and the Government's vision of 'the green economy' is as a bolt-on, freestanding part of the broader economy rather than a holistic approach and has particular emphasis on energy efficiency linked to carbon-reduction targets (Upstill-Goddard *et al.* 2013).

Limited regime leadership is provided by the UK government: so does the market play a major role as a driver of sustainability? Within 'green' building practices there is a spectrum of leadership and innovators, from radical, alternative individual businesses often operating in small-scale house building, to major players involved in large urban development with a straightforward focus on environmental market opportunities (Gibbs and O'Neil 2014). While personal values are important for small businesses and 'green entrepreneurs', for larger companies it is the threat of losing work for not having sustainability credentials. Glass *et al.* (2012, 39) found that responsibility is shared by different parties within projects, but clients take the lead role, some as 'early adopters' and others driven latterly by cost, legislation or market forces. Overall 'affordability' is the most important determiner of sustainable construction practices (Häkkinen and Belloni 2011). The motivations for companies to engage in sustainable construction are benefits including leading the market, gaining competitive advantage and demonstrating CSR; reputation is especially important for building suppliers (Glass *et al.* 2012). Sustainability is routinely built into contractors' practice as ethical reputation attracts some customers. In the UK there is a feeling that larger companies are 'jumping on the bandwagon' of sustainable construction to the determinant of smaller, greener firms (Gibbs and O'Neil 2014). The trendy-ness of sustainability is important to consider as for some contractors sustainability has become less important, likely a direct consequence of the economic recession (Young and Osmani 2013). Conversely Glass *et al.* (2012) found that manufacturers reported having sustainable certification has made it easier to sell products even in a very difficult year as it enhanced their reputation and customer confidence. This suggests that in tough economic times there is pressure on reducing costs, but also a more competitive environment and firms need to maintain their reputations through whatever means available. Corporate reputation alongside

personal values, organisational ethics and interpretations of sustainability play a role in shaping practices (Häkkinen and Belloni 2011). Throughout the capital intensive construction sector the primary emphasis is on short-term profitability and risks, rather than life-cycle benefits, as those responsible for upfront costs do not normally receive the longer term benefits and clients are concerned about higher risks (Young and Osmani 2013). Greater costs and risks do not just mean materials, but also increases in consultancy fees or slower completion rates due to unfamiliar techniques, uncertain pay-back periods, lack of experience and less product information (Häkkinen and Belloni 2011). In contrast, CSR is seen as a risk management strategy, especially for multi-national corporations and mega-projects (Fainstein 2008). Sustainable approaches can act as an 'insurance policy' and demonstrating compliance with voluntary schemes can mean lower legal costs in British courts in the event of an environmental incident (Upstill-Goddard *et al.* 2013).

In the UK the pioneering development of a sustainable construction sector has been led by owner-occupiers who are less constrained by market norms. Government and local authorities are often the lead clients on mega-projects or steer their development, promoting exemplary projects, diffusing ideas and initiating the broad adoption of methods. Corporations that have already committed to sustainable development goals are also influential in driving transitional projects. Marks and Spencer's, a UK retail firm that has made a strong commitment to sustainability in their core business, commissioned the Cheshire Oaks Eco Store, which has won awards for sustainability and spread reputational benefits to the construction firms involved (Upstill-Goddard *et al.* 2013). Importantly, with long term increases in hydrocarbon costs improved energy efficiency is becoming more attractive and reflected in property values and

client satisfaction is often greater with green buildings (Brown and Southworth 2008; Leaman and Bordass 2007).

Sustainable construction requires close coordination and the cooperation of stakeholders with potentially divergent values systems (Mills *et al.* 2009). Intra-project conflicts occur in mega-projects and although clients are important their influence can be diluted (Shi *et al.* 2012). For instance, if you take the construction of a railway station, it is likely to be funded (in part) by the public as well as other sources of investment, commissioned by a client, who employs an agent, who hires an architect and designers to produce a concept that can be built by a contractor, who uses various sub-contractors and numerous suppliers. Once constructed the station will be used by the general public, train operating companies, station staff and retail tenants. The various levels of interconnectedness and technical challenges mean that ethical and moral decisions become diluted as all parties are not driven by the same values. The transformation of the built environment in mega-projects is often both public and private which means final clients are unable to exert power (Hayes and Horne 2011).

Socio-technical Transitions and Sustainable Construction

The sustainable construction sector is 'part of a broader network of actors and institutions involved in the shift towards a green economy' (Gibbs and O'Neil 2014, 1089). The notion of a shift or transition to sustainability 'is firmly rooted in the traditions of system thinking which highlight the coevolution of the social and technical' that enable us to begin to understand how regimes are dislodged and replaced by new dominant practices (Shove and Walker 2007, 763).

Work on transitions permeates through academic, civil society and policy literature. There is an underlying assumption that to address global climate change new technological processes need to co-evolve and also be anchored in social change. Research has focused on alternative energy generation and new transport infrastructure as well as urban sustainability (Bulkeley *et al.* 2014). Socio-technical transitions can help explain how some innovative parties may be embracing sustainable approaches in new projects in urban spaces, as well as why many are not. Despite the availability of sustainable designs and new technologies, the engagement with sustainable construction is restricted by a variety of costs and risks. The adaptive capacity of different construction sector actors – architects, project managers, contractors, sub-contractors, building suppliers – is profoundly 'influenced by the market and regulatory contexts within which they operate' (Berkhout *et al.* 2006, 136).

Cities have become a focus for socio-technical transition research, one reason is because they are spaces where governments promote climate mitigation strategies resulting in projects 'over-complying with or leading national or international norms and regulation' (Affolderbach and Schulz 2015; 2). London's mega-projects are frequently showcases for the wider application of new sustainable technologies and can be considered as 'niches'; that is special contexts which enable experimentation with promising sustainable approaches, where general rules such as completion do not apply (Berkhout *et al.* 2004; Fainstein 2008). The characteristics of mega-projects – unique, large-scale, often public funded, contentious, monumental, and subject to media scrutiny (especially for those based in London) – provides a distinctive social context which promotes the adoption of new sustainable technologies (Hayes and Horne 2011). However it should not be assumed that innovation at the niche level of individual mega-projects will follow a teleological path and spread in to the mainstream across London and other urban

environments. Broader adoption requires 'the right alignment of conditions, their changes, shifts and contradictions between' the niche and other levels (Affloderbach and Schluz, 2015; 4-5).

Nested above the mega-projects niche is the socio-technical regime and the landscape level (Geel 2004). The broader regime – namely the UK urban construction sector – is a more pervasive and stable level that is influenced by the rules and norms that guide construction practices, which includes the UK government's target setting, trade accreditation schemes, engagement with CSR and cost and risk minimisation (Lawhon and Murphy 2011). The spread of particular types of action as new stable configurations of institution, techniques, rules and practices, coalesce around what become the *normal* use of technologies at the regime level (Berkhout *et al.* 2004). The wider adoption of sustainability practices in other contexts, both in the construction industry internationally, and in shifting attitudes in wider society, makes up the third level: that of a socio-technical landscape of 'cultural and normative values, broad political conditions, long-term economic developments, [and] accumulating environmental problems' that further shape the UK construction sector's engagement with sustainability (Geels 2004, 34). Construction companies are nested in society and influenced by broader values and national cultures. To operate in this landscape building organisations must gain a minimum level of social approval in order to attract the best new recruits, access to resources, and find markets (Mills *et al.* 2009).

The multi-level socio-technical transitions approach has attracted some criticisms that have been outlined by Affolderbach and Schluz (2015). First, they identify how the approach has a rigid hierarchical logic that separates processes between local and national scales and reifies spatial scales so that case studies become isolated from wider processes (Bulkeley *et al.* 2014). Secondly, socio-technical transitions studies have a narrow focus on the knowledge and interests of elite actors such as technical experts and entrepreneurs. To avoid these two epistemological

shortcomings we took the approach of working with a sample population of construction professionals who have experience of working across multiple mega-projects and did not take a narrow approach focused on one single mega-project. Additionally, while our sample included influential individuals it did not focus on elite actors, as we examined what shapes the decision making process of people involved in day to day procurement activites. We also sort to understand the social context in which decisions around sustainability are undertaken and interrogated the research participants relationships with other actors. As has been identified sustainable procurement (discussed further in the next section) has become *the* means through which the sustainability of construction is assessed (Walker and Phillips 2009; Young and Osmani 2013). To understand the dominance of sustainable procurement the connections procurement specialists have with other actors at the niche, regime and landscape need to be explored and there is need for empirical work 'to account for the power plays in guiding or preventing transitions towards more sustainable outcomes' (Lawhorn and Murphy 2011; 355).

To investigate relationships in sustainable procurement we first reviewed both publically available reports, and others texts obtained via personal communication, from six major construction companies (Balfour Beatty, Carillion, Costain, Laing O'Rourke, Morgan Sindall, Skanska) all ranked within the top 20 in the UK by turnover and involved in mega-projects in central London (Construction Index 2012). The literature demonstrates the central significance of procurement in the socio-technical transition to sustainable construction therefore it was decided to focus the sample on contractors to investigate how and why they procure specific types of material. Qualitative data gathered from the document analysis provide a platform from which to construct subsequent questionnaires (n=70) and interviews with key stakeholders (n=9). After piloting, non-probability purposive sampling was used and participants within the six firms were

selected due to their job roles. We identified professionals who worked in procurement and allied positions including account managers, buyers, commercial managers, procurement professionals and quantity surveyors. A snowballing approach was applied to obtain the questionnaire sample and informants were asked to provide further contacts; and a link to an online questionnaire was emailed to initial informants. Snowballing resulted in a self-selected sample; therefore respondents are not limited to the six companies listed above. Due to the voluntary nature of the sampling, the respondents are more likely to already be engaged with sustainability. While questionnaires were used to survey attitudes towards sustainability, interviews gave individuals 'voices'. To undertake the interviews we used professional contacts or 'gatekeepers' to provide names of procurement specialists. We sought to represent different specialities and varied roles and statuses. Those interviewed comprised of people from the same six companies detailed above with the following roles; Buyer, Commercial Manager, Procurement Manager, Quantity Surveyor and Subcontract Buyer. Following a pilot, nine semi-structured in depth interviews were conducted at one location in London. Prior to commencing interviews, each of the participants was approached personally and given an information sheet and consent form. This face-to-face contact enabled discussion about the nature of the research, increasing interest in the project, with additional participants even requesting to be interviewed. The semi-structured approach of the interviews allowed questions to be tailored to different professionals and backgrounds. Interviews lasted between 30 minutes and an hour and were audio recorded to facilitate analysis, provide further access to responses, and reduce interviewer error. The recordings were then transcribed and code mapping was implemented to identify themes.

Sustainable Procurement

What first emerged from the literature review and was reinforced in questionnaires and interviews was the central significance of the procurement of 'ethical' or 'environmentally friendly' materials in sustainable construction. Most often the process is termed 'sustainable procurement' or the 'responsible sourcing' of building materials. In characterising 'sustainable procurement' many research participants displayed an environmentally skewed view mirroring the proliferation of environmental research, and increased lobbying from prominent pressure groups, however there were divergent reflections on the relative importance of social, economic and environmental factors (Walker and Phillips 2009). Interestingly many research participants said their personal values and views of procurement in the workplace were linked to external sources of information such as documentaries and newspaper coverage at the socio-technical landscape level. Lack of certainty over the definition of sustainable procurement is compounded by construction company literature, with companies like Balfour Beatty and Skanska using it as an umbrella term, while others take a more limited approach. Sustainable procurement with its various definitions has led to confusion and distrust with some identifying it as a potential short term 'fad' or 'buzz word'. Our research in to how sustainable procurement is understood led to three key findings 1) Cost, existing methods and short term planning constrain sustainable procurement, 2) There are reputational motivations for firms to engage with sustainable procurement, 3) That individual and socially determined values are important in framing the adoption of new technologies:

(1) Price, existing procurement methods and short term planning were cited by participants as the top three pressures on sustainable procurement (see Figure 1). Cost, or perceptions of cost, was continually cited as a major barrier to sustainable procurement. The

need to remain competitive is clearly important, there is a fear, possibly rooted in a lack of understanding, that if sustainable procurement is introduced the company may fail to remain competitive: 'If you're competitively tendering and you've got your competitor and it's going to cost you 200 grand [£200,000] to use sustainable procurement and you're trying to cut corners and get your price down I'm sure that'll be one of the things that gets spliced' (Interview 6, Quantity Surveyor). Fear of cost over-runs may be borne out of reluctance to trial new products or innovative methods of working. A few participants rejected the idea that sustainable procurement decisions are governed by price; 'costs often don't come into the situation' (Interview 8, Buyer). This was reinforced by the questionnaire, where responses indicate that only 6% of participants believe that sustainability should involve procuring at an increased cost. 'Normally the misconception is that if it's environmentally friendly it's going to cost more. So that's the battle' (Interview 5, Buyer). The conflicting messages provided through interviews and questionnaires indicates that while there is a general understanding of the fundamentals of sustainable procurement, opinions vary as to if the economic and business benefits of sustainable procurement outweighed the initial outlay. The argument that sustainability elevates costs is often based around short-term approaches to sustainable procurement. Many respondents believe this short-termism is driven by programme constraints, shareholders and the disconnect between whole life costs and start-up costs: 'You're offering to save people money that they haven't actually got, so in 10 years' time it'll be great, but you've got no money at that stage' (Interview 9, Commercial Manager). Costs though are difficult to forecast or simulate and may involve errors, especially for bespoke products often used in mega-projects. Sustainable solutions were often described as requiring increased planning; longer manufacturing times or lengthy processes.

INSERT FIGURE 1: Main drivers and barriers to sustainable procurement

(2) Responsible sourcing has become important for reputations, CSR and relationships with other stakeholders **(**Upstill-Goddard *et al.* 2013; Young and Osmani's 2013). Major suppliers of responsibly sourced materials are bringing new products to market, but demands from procurement experts, major contractors and clients also drives change. Some are targeting 100% responsibly sourced for the main commodities such as aggregates, metals, steel, concrete, bricks and glass (Glass *et al*. 2012). There is suspicion among some insiders over the longevity of sustainable procurement, but also there is increased pressure to demonstrate 'responsible' business and awareness of CSR in purchasing decisions. Businesses are recognising that although stakeholders want value for money they are also looking for reputational benefit. For some construction firms prioritising sustainability is motivated by a desire to manage reputational risk, to assess opportunities and challenges within the supply chain, or simply the greater availability of sustainable products. For others it may be driven by moral responsibility or a positive organisational attitude. More cynically, sustainable procurement could be seen as an attempt to enter a niche market or to pre-empt policy changes to the regime to gain a competitive advantage.

(3) Procurement staff indicated that sustainable procurement is generally perceived as a peripheral aspect of the construction sector and so personal values are important in delivering sustainability. Firms would otherwise only do what is required, or they are simply too busy to consider it. Several participants highlighted that those with influence or power and those with responsibility for the environment were often not the same people. These conflicting pressures

are exacerbated by differing ideals, or the perception that project managers, clients and procurement individuals lack compatible values. Aside from worker health and safety, which is of overriding importance, cost reduction is the principal client objective. Some feel coerced by senior management into procuring in ways that are not sustainable: 'personally I would like to see more environmentally friendly materials used, but I'm afraid that cost is a big factor' (Interview 8, Buyer). Questionnaires indicated that client and senior management buy-in were important drivers of sustainable procurement: 'sustainability in construction is about having the right people, behaviours and tools. Procuring people with no appreciation of the importance of sustainability will result in poor delivery' (Questionnaire 36). Interviews suggested that there were problems with project complexity and a lack of support which results in inertia. Adopting sustainable procurement requires a constellation of social as well as technical changes to the construction regime. Procurement specialists see themselves not as a passive link in the supply chain, but as accountable, dynamic actors, where good quality 'ethical' procurement is able to exert vertical influence on both clients and suppliers.

Sustainability and Labelling

In order to deliver sustainable procurement buyers and other stakeholder have only limited information to determine the ethical credentials of products. A variety of labelling systems provide customers for building supplies with measurable assessments methods, similar to the labelling schemes used with individual household consumer products (e.g. Fairtrade, Organic and Rainforest Alliance) (Brooks and Bryant 2014). Currently there is no single definition for voluntary sustainable procurement or eco-certification and labelling schemes (ECLs). An increasing number are being used including BES 6001, BS 8903, Blue Angel, CSA, FSC and

PEFC (BSI 2010; Gale 2002), but notably concerns over ‘green washing’ and around the success of ethical sourcing codes were raised in our interviews. ECLs are focused on major construction elements such as steel and timber, with little certification of more complex components such as terrazzo or those sourced outside of Europe. Successful schemes such as FSC have pushed government and businesses to take ECLs seriously, with 100% of timber used on the London Olympic Park certified as sourced legally and sustainably (Davies 2012). The UK government set a target of 25% of materials in the construction industry to be sourced responsibly by 2012 (HM Government 2008). It is unclear if this target has been met or how it was to be monitored, although industry sources suggest the target was missed, for instance in the precast cement sector (British Precast 2013).

ECLs, although increasing in number, are absent from the majority of products so fail to provide a holistic approach. The barriers to increasing the procurement of sustainably labelled products include small profit margins, lack of information, perceived risk and the blurring of responsibilities between decision makers. Responses indicated that 84% of those surveyed would be encouraged to choose more sustainable products if increased product information was available. When asked about ECLs, one participant described them as: ‘Very useful’ and several respondents drew a parallel with the labelling and qualities of consumer goods including products from Marks and Spencer and B&Q [a home improvement store]. Like household consumer schemes, ECLs appear to be favoured as a reference point, something simple that contractors can implement to which a ‘yes’ or ‘no’ response is provided and facilitate the auditing of subcontractor compliance. Document analysis revealed that some companies are very reliant on this form of labelling, with certain ECLs, such as sustainably sourced timber, mandated throughout a build. Despite positive survey and document analysis responses, those

interviewed were much less keen: ‘I could look at an environmental award that they’ve won for something and I wouldn’t have an appreciation of it’ (Interview 6, Quantity Surveyor). A number of procurement staff viewed ECLs as a minimum standard, stating ‘sometimes you don’t have to do a lot to get an accreditation’ (Interview 4, Procurement Manager) and that ECLs simply provide guidance where governments fail to regulate (Bell and Hindmoor 2012). They are also seen as excluding small and medium enterprises through being ‘time consuming and very resource intensive’ (Interview 4, Procurement Manager). Many felt that trade-offs had to be made between large certified and local un-certified companies. The plethora of ECLs and award schemes has led to a feeling of certification overload, with some questioning the validity of the award schemes; ‘everyone seems to get an excellent’ (Interview 5, Buyer). This market saturation has led to questions over credibility and a feeling that at the regime level industry and trade bodies promote ECLs to ensure self-regulation and avoid state intervention (Gale 2002).

Contractor Branding and Mega-Projects

In the market place for mega-project contracts ‘where margins are so tight at the moment, competition is fierce […] a lot of companies are starting to think that sustainability is the way forward’ (Interview 4, Procurement Manager). In much of the company literature, contractors offered *sustainable solutions* in order to capitalise on a niche market and provide something extra for which their clients could chooses to pay. Respondents provided polarised views when questioned about such branding exercises, with some describing it as extremely important in gaining mega-project contracts while others felt it to be inconsequential: ‘In order to win work you need to demonstrate that you have done the right things in the past’ (Interview 2, Subcontract Buyer) and in contrast: ‘I don’t think brands matter’ (Interview 9, Commercial

Manager). While personal beliefs surrounding the importance of brands differed, many thought sustainable procurement helped change the image of construction stating that positive symbols of sustainability included green roofs, solar panels, and community gardens. Questionnaires revealed that reputation and work winning were seen as the main drivers of sustainable procurement. These motivators are closely linked with reputation where to win prestigious mega-projects companies need good sustainability credentials. To retain niche markets and ensure competitiveness, some respondents criticised companies for complicating products and services to protect their niche area 'those people want to mystify it so they want to tell the client they're doing this really complicated stuff where in actual fact it's not that complicated' (Interview 9, Commercial Manager). Others saw sustainable procurement less as a niche expertise, but as a dispensable novelty or luxury. One participant recalled they worked with a sustainability manager who 'was really good, but as soon as the recession hit she was the first person to lose her job' (Interview 2, Subcontract Buyer).

There are some substantial concerns that sustainable procurement may only give construction the appearance of sustainability, without delivering fundamental change. One interviewee commented that with accreditation you 'stick it up on the walls saying you've won an award, nice old emblem saying you've won something, [it] looks the part'. This flippant response outlines the opinions of the majority of respondents who believe that construction companies wish to *appear* to be responsible to clients. This desire to give the impression of being sustainable results in claims of 'greenwashing' or that contractors are paying 'lip-service' to sustainable procurement rather than implementing robust principles and practices. The perception that a company is at the forefront of sustainable procurement, rather than responding to government or client pressure is advantageous, providing a positive effect on employees and

client relations (Osipova and Eriksson 2011). Others felt that sustainable procurement helped change the image of construction on a grassroots level; that working with the local community and ensuring a good external image made the completion of jobs easier.

Components that are conspicuous attract more attention and therefore clients, end-users and even procurement staff believe they add value to a project. This was outlined in various discussions around the photovoltaic solar panels used on the Blackfriars Station mega-project. One respondent (Interview 2) uncritically expounded the merits of solar panels 'I think the end user will look it and go, like at Blackfriars "ah look at this, this is great, solar panels, really innovative" […]. Maybe they don't have an impact but a visual impact' (Interview 5, Buyer). In contrast, another participant claimed that Blackfriars is 'not terribly efficient and would have cost a fortune' to build (Interview 9, Commercial Manager). Gibbs and O'Neil (2014) have also reported conflicting positions on solar technology, their research with building professionals found that most agreed solar panels should only be added to a project once other issues such as insulation and draughts had been addressed, as they were not seen as very sustainable technologies. The importance of overall design rather than applied sustainable procurement was consistently cited as a problem with mega-projects and here it was the greenhouse like Shard skyscraper which stood out as an example of ostentatious aesthetics over-riding sustainability: 'If you look at the Shard, it's a big glass greenhouse stuck in the middle of London and it must be costing an absolute fortune to keep it cool, so there's a vanity that sits in front of environmental development at the moment I think' (Interview 9, Commercial Manager). Interviewees suggested that the role of architects should be reviewed and 'designers have a role to play in trying to bring [sustainable] construction back into the market' (Interview 9,

Commercial Manager) and the influence of architects on sustainable transitions is an avenue for further research.

Conclusion

London's mega-projects are acting as a showcase for a transition to sustainable technology, while also being unique projects which operate outside of normal rules (Fainstein 2008; Faulconbridge 2013). Moves to establish a more sustainable approach to procurement are based around modifications to current practices rather than a fundamental reworking of the ways in which projects are organised. This paper has demonstrated that sustainable procurement is the primary means through which sustainability is delivered, and our empirical work shows the importance of the social role that decision makers play in mediating the uptake of new technologies and materials. There is not a single driver of the growth in sustainable procurement but layers of social influences and vested interests, such as non-governmental accreditation organisations, the dominance of large supply companies who subscribe to emerging industry sustainability standards, and the convenience of a market based opt-in binary system which allows simple yes/no decisions on sustainability. This has important implications for socio-technical transition theory, policy makers and future research which we will now outline.

Mega-projects like Blackfriars station are operating as niches as they are specific places in London which have become a focus for innovation and garner great attention. The addition of photovoltaic solar panels to Blackfriars is indicative as it gives the appearance of sustainability through the procurement of a technology. As Shove and Walker (2007) argue it is important to understand who wins and who loses out as transitions to sustainability are steered in certain directions. The central importance of sustainable procurement, as the major organising principle

in transitions, has provided gains for some companies including early adopters who have positioned themselves as innovators at the forefront of the market (e.g. Skanska) and have been able to leverage sustainable procurement to improve their CSR and reputation. Companies at the forefront of sustainable construction may be system building; that is translating and mainstreaming green technologies through specifically encouraging sustainable procurement to forge pathway dependency (Gibbs and O'Neil 2014). Innovative green local small suppliers may also lose out, as although they pave the way, larger companies dilute sustainable principles in big projects (Upstill-Goddard *et al.* 2012).

The transition to sustainability is often being led by new mega-projects. At the regime level this translates into promoting the sustainable procurement of materials for new-builds which means that 'easier' steps towards a more sustainable future may be missed. Given the extent and durability of London's building stock the greatest opportunity for improving sustainability resides mostly with the existing infrastructure. For instance replacing current heating and cooling technologies in old buildings, with more sustainable solutions for energy use (Brown and Southworth 2008). Neither the government nor industry is providing leadership in this direction and therefore the existing socio-technical assemblage which champions sustainable procurement may even close down spaces for alternative approaches. We have to be careful to not paint transitions as inevitable, but rather the result of struggles of meaning, and unequal agency and power (Shove and Walker 2007). While sustainable procurement may at first appear to be a step in the right direction the limited and uneven application in the innovative niche of London's mega-projects highlights how there are limits to the social engagements with sustainability and many barriers to navigate. Transitions take time to complete and are not a linear process. Pressures or shocks can both enable and stifle innovation. Sustainable practices have been

destabilised by the recession, at least for contractors, whereas for suppliers following the 'pathway' of bringing more sustainable products to the market place is a way to enhance their client base and reputation (Glass *et al.* 2012).

Our work has major implications for policy makers. Research subjects continually cited the limited information as being a real challenge that reduced their ability to change procurement patterns. Findings demonstrated that cost, familiarity with existing procurement methods and short term constrains in decision making were all major barriers that need to be addressed to enable the broader procurement of sustainable technologies and materials. The primary way in which this could be achieved is through more product information about the long-term benefits of particular technologies, such as reduced energy costs. The government has so far taken a 'back-seat' approach rather than mandating product information and leadership in this area could enhance the application of sustainable approaches (Bell and Hindmoor 2012). Secondly the reputational motivation is very important. While some firms like Skanska may be able to brand themselves and offers sustainable 'solutions' for mega-project and other builds, such efforts at distinction making may result in sustainability remaining as only a premium service, instead of being a core concern for all construction companies. The way in which health and safety has become a major concern in building projects in the UK, and one which can override cost constraints, may offer hope that priorities can change and sustainability may also become a fundamental consideration in mega-projects as well as the construction sector more broadly if it is similarly mandated (Love et al, 2013). Personalities, unspoken feelings and beliefs are important and senior managers are key drivers or barriers to change (Mills *et al.* 2009; Young and Osmani 2013). Individuals can act in visible ways through supporting sustainability causes and taking an interest in wider social and environmental issues. Here the performativity of

‘green’ business people is important. These actors operate in a symbiotic and evolving way with the social and political regimes around them (Berkhout *et al.* 2006). Given the central role of key decision makers in enabling or resisting sustainable procurement, change could be accelerated if awareness was raised among senior project managers about the importance of sustainability, this would also likely have a big impact on facilitating transition.

Finally in terms of a future research agenda it is important to consider the limited role that sustainable procurement can play in bringing about a transition to a more sustainable construction sector. The form of thinking which reduces sustainability either to the procurement of materials or the addition of green technology to flawed designs can help externalise costs, ensuring that sustainability impacts are only nominally accounted for to minimise reputation risks and enhance CSR, a framing which is problematic as impacts extend beyond the use of materials. To properly embrace sustainability the sector needs to ensure that long term impacts are taken into account, not just immediate losses or gains from for instance the use of recycled instead of conventional aggregate or the addition of wind turbines to sky skyscrapers. Research needs to investigate and measure what real gains have been delivered through the deployment of sustainably procured materials and systems in London’s mega-projects. Such technical evaluations require social scientists to work with engineers as well as drawing upon knowledge from within the industry. For geographers and other researchers there is a need to provide more detailed social mapping of the relationships between procurement managers and other decision makers, future research could achieve this by building upon our work by providing in-depth study of specific mega-projects.

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